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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/825,394	04/14/2004	Vishwas V. Hardikar	004.0128	8468

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EXAMINER
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GEORGE, PATRICIA ANN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 10/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/825,394

Applicant(s)

HARDIKAR, VISHWAS V.

Examiner

Patricia A. George

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 15 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 36-43 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 36-43 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 36 rejected under 35 U.S.C. 102(b) as being anticipated by Patel et al. (2003/0171239) (herein referred to as Patel), evidenced by University of Florida (<http://www.cop.ufl.edu/safezone/prokai/pha5100/Eagents.htm>) (herein referred to as UFL) and Princeton Environmental Institute (Chelation, uptake, and intracellular binding of trace metals; <http://www.princeton.edu/~cebic/chelbindadvanced.html>).

Patel et al. teach methods of processing wafers, include: CMP by slurry (i.e. polishing a wafer with slurry having a pH and ionic strength) (see para. 9); after the CMP a step of CMP wetting (para. 64 and figure 4), wherein the composition comprising non-ionic surfactant (i.e. wetting agent) (paragraph. 0047). Patel teaches wt% of non-ionic surfactant 0.6 – 5 wt %, which is encompassed by applicants' claimed range of 0.005-10 wt % (see Table 1). Patel inherently teaches wetting agent (i.e. non-ionic surfactant) with HLB value of 7-9 (evidenced by UFL, teaching HLB levels of surfactants, including wetting agents at 7-9 HLB) encompassed by applicants claimed range of 1-15). Patel teaches the composition has corrosive inhibitors and chelating agents, well known to have the inherent property of complexing with trace metal

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impurities and Cu (see 0041, evidenced by Princeton Environmental Institute). Patel teach the composition is particularly good for cleaning CMP copper substrates (see 0105). Patel et al. teaches pH adjusters (see para. 0110).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 37 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Patel et al. (2003/0171239), in view of Cooper et al. (Comparing the effectiveness of knobby and ridged post-CMP cleaning brushes; Micron Technology; July 1999; Micromagazine; archive; [www.micromagazine.com](http://www.micromagazine.com), page 1 of 9).

Although, Patel et al. teaches wetting compositions to the wafer surface for precision CMP, post-clean, and post-cmp rinsing (para. 26-29), Patel does not teach the composition is sprayed or brushed on, or that loading occurs via a load cup as in claims 37-39.

Cooper et al. teaches methods for post cmp clean utilizes rotating foam brushes while sprayed, as in claims 37, and 39, to remove excess metal and slurry particles, to avoid adverse effects in downstream processing (see page 1 of 9).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to modify the invention of applying the CMP post clean composition of Patel et al, by incorporating the use of utilizes rotating foam brushes while sprayed, as in claims 37, and 39, because Cooper teaches the process removes excess metal and slurry particles, to avoid adverse effects in downstream processing.

### ***Claim Rejections - 35 USC § 103***

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Patel et al. and Cooper et al., as applied to claims 37 and 39 above, further in view of Karlsrud et al. (5,329,732).

As to claim 38, the modified teaching of Patel et al. is silent as to the delivery methods implored to transfer the wafer to the post clean station, such as loading the wafer into a load cup, as applicants' limitation of claim 38.

Karlsrud et al. illustrates a well known method implored to transfer the wafer to the post clean station, loading the wafer into a load cup, as applicants' limitation of claim 38 (see col. 11-12, lines 45-17).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to modify the invention of Patel et al., to include the a well known method implored to transfer the wafer to the post clean station, loading the wafer into a

load cup, as applicants' limitation of claim 38, because Karlsrud et al. illustrates it is a well known method.

***Claim Rejections - 35 USC § 103***

Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable by Patel et al. (2003/0171239) (herein referred to as Patel), in view of Misra (7,087,564), and Kern (Editor of Handbook of Semiconductor Wafer Cleaning Technology - Science, Technology, and Applications; William Andrew Publishing/Noyes; ISBN: 0-8155-1331-3; Mar 21, 2001)

Patel et al. teach methods of processing wafers, include: CMP by slurry (i.e. polishing a wafer with slurry having a pH and ionic strength) (see para. 9); after the CMP a step of CMP wetting (para. 64 and figure 4). Patel teaches the composition has corrosive inhibitors (see para. 0041) Patel teach the composition is particularly good for cleaning CMP copper substrates (see 0105). Patel et al. teaches pH adjusters (see para. 0110).

Although Patel teaches pH adjustment, Patel is silent as to the wetting composition within 1 (plus or minus) pH of the CMP slurry pH, as in claim 40.

Mirsa teaches to match the pH of the wetting (i.e. cleaning) solution to that of the last slurry used on the wafer surface (see abstract of 7,087,564), i.e. matching withing applicants' claimed limitation within 1 (plus or minus) pH of the CMP slurry pH, as in claim 40.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include matching the pH of the wetting and slurry compositions, as Misra, when performing the copper processing, as Patel, because Misra teaches an improvement which removes particles efficiently, removes metal from the dielectric surface, protects the metal from corrosion and dissolution, and does not contaminate the semi conductor surface (see ab. of 7,087,564).

Patel is silent as to the ionic strength of the composition as in applicants' limitation of claim 40.

Although Patel is silent as to the ionic strength of the composition as in applicants' limitation of claim 40, it would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the ionic strength as applicants' claim limitation, when using the methods that including a CMP wetting composition, as the modified invention of Patel, because it has been help that products of identical composition can not have mutually exclusive properties (see MPEP 2112.01).

Patel is silent as to the ionic strength of the composition as in applicants' limitation of claim 40.

Kern teaches that the pH of a composition, and colloidal potential are relative to the ionic strength of the wafer cleaning composition (see pages 180-183), and illustrates that ionic strength is a properties of a wafer cleaning composition that may be controlled or adjusted for a desired effect within a range of  $10^{-5}$  to  $10^{-1}$  mol/liter,

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which encompass applicants claimed range of  $10^{-5}$  to  $10^{-2}$  mol/dm<sup>3</sup> (mol/dm<sup>3</sup> = mol/liter) (see page 184).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include applicants' claimed range of ionic strength, when using a cleaning composition to clean wafers, as Patel, because Kern illustrates such a range is effective and may be controlled for a desired effect colloidal deposition which impacts electrostatic double layer repulsion, that impacts interacting diffuse layers of a colloid and a wafer surface, i.e. resulting in controlling the removal of contaminants, a known process improvement (See pages 180-184). Also, since Patel does not limit the ionic strength, one of ordinary skill would select any ionic strength within the range of Kern, including applicants' specifically claimed range. Furthermore, in absence of unexpected results one of ordinary skill in the art would be motivated to use any ionic strength within the range of Kern, for cleaning wafers, including the range disclosed by applicants.

### ***Claim Rejections - 35 USC § 103***

Claims 41 and 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Patel, Misra, and Kern, as applied to claim 40 above, in view of Cooper et al. (Comparing the effectiveness of knobby and ridged post-CMP cleaning brushes; Micron Technology; July 1999; Micromagazine; archive; [www.micromagazine.com](http://www.micromagazine.com), page 1 of 9).



Although, Patel et al. teaches wetting compositions to the wafer surface for precision CMP, post-clean, and post-cmp rinsing (para. 26-29), Patel does not teach the composition is sprayed or brushed on, or that loading occurs via a load cup as in claims 41 and 43.

Cooper et al. teaches methods for post cmp clean utilizes rotating foam brushes while sprayed, as in claims 41, and 43, to remove excess metal and slurry particles, to avoid adverse effects in downstream processing (see page 1 of 9).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to modify the invention of applying the CMP post clean composition of Patel et al, by incorporating the use of utilizes rotating foam brushes while sprayed, as in claims 41, and 43, because Cooper teaches the process removes excess metal and slurry particles, to avoid adverse effects in downstream processing.

### ***Claim Rejections - 35 USC § 103***

Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over Patel, Misra, Cooper, and Kern, as applied to claims 41 and 43 above, further in view of Karlsrud et al. (5,329,732).

As to claim 42, the modified teaching of Patel et al. is silent as to the delivery methods implored to transfer the wafer to the post clean station, such as loading the wafer into a load cup, as applicants' limitation of claim 42.

Karlsrud et al. illustrates a well known method implored to transfer the wafer to the post clean station, loading the wafer into a load cup, as applicants' limitation of claim 38 (see col. 11-12, lines 45-17).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to modify the invention of Patel et al., to include the a well known method implored to transfer the wafer to the post clean station, loading the wafer into a load cup, as applicants' limitation of claim 42, because Karlsrud et al. illustrates it is a well known method.

### ***Response to Arguments***

Applicant's arguments, see page 3 abridging page 4, "adjusting pH does not mean that there is a ...+/- 1 pH unit of pH of the slurry", filed 8/15/2006, with respect to the 35 USC 102 rejection of claim 40 has been fully considered and is persuasive. The 35 USC 102 rejection of claim 40 has been withdrawn. Please see the new grounds of rejection, above.

As to applicants argument on page 3, Patel seems to teach away from surfactants having HLB range from 1-15, please see ULF reference offered above that provides evidence that wetting agents (i.e. such as Patel's wetting composition) have an HLB range of 7-9. As to applicants remarks, on page 3, that surfactants POE or POP are required for measuring HLB values, examiner disagree and provides evidence above that all surfactants and oils have HLB values, and thus are not limited to the inclusion of POE or POP. As to applicant's remarks toward ionic strength, on page 5,

examiner would like to thank applicants for the general teaching on calculating ionic strength, but disagree on the point that Pateal and applicant's composition are not identical, see new grounds of rejection above.

### **Conclusion**

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US 2005/0191961

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patricia A. George whose telephone number is (571)272-5955. The examiner can normally be reached on weekdays between 7:00am and 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571)272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
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09/06

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Examiner  
Art Unit 1765

NADINE NORTON  
SUPERVISORY PATENT EXAMINER  
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